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ABSTRACT

This study examines the effects of class properties on individual learners. Subjects represented a random sample of 800 pupils in 113 Harvard Project Physics classes during 1968, and were divided into eight same-sex samples--one for each of four learning criteria. The Learning Environment Inventory was used to obtain 14 climate scores. Regression-adjusted gain scores of individuals were related to individual IQ, class mean climate properties, and their interactions. To give an indication of the types of relationships found, this paper examines three social climate properties--intimacy, friction, and cliqueness. These are considered in their relationship to female gains on one learning criterion only, Test of Understanding Science (TOUS). Intimacy is positively related to TOUS gains for females of high ability but bears a negative relationship to learning for females of low ability. Extremes on friction are positively related to gains in science understanding. Cliqueness of school classes acts similarly to friction for females. This study has implications for helping researchers and teachers to understand, control, and harness the potential influence of peer group forces on school experiences. (Tables of results and a list of references are attached.) (JIB)

EFFECTS OF CLASSROOM SOCIAL CLIMATE ON INDIVIDUAL LEARNING 1

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Why are some school classes more difficult to teach than other classes? What accounts for different patterns of teacher-pupil relationships in various classroom groups? Teachers often suggest that classes have a distinctive personality or "climate" which influences the learning efficiency of their members. In some classes, the difficulties of one pupil become the concern of all. In other groups, each child works for personal rewards and the presence of others does little to aid or frustrate his individual learning. The properties of school classes that account for some of these differences have been termed the classroom social climate. Derived from prior group research and from an intuitive analysis of the types of interactions that are present in typical school classes, these climate properties include interpersonal relationships among pupils, relationships between pupils and their teacher, relationships between pupils and both the subject studied and the method of learning, and finally, pupils' perceptions of the structural characteristics of the class.

Previous research on classroom social climate has provided some insights into two aspects of the social psychology of the school class group. One study (Walberg and Anderson, 1968) considered the relationships between individual pupil perceptions of their class and their individual learning; a subsequent study (Anderson and Walberg, 1968) attempted to account for differential class performance in terms of the climate characteristics of the class. This study uses yet another focus and attempts to bridge the gap between the prior studies by examining the effects of class properties on individual learners.

METHOD

The subjects represented a random sample of approximately 800 pupils who were in 113 Harvard Project Physics classes during 1968-68. Subjects were divided into eight same-sex samples (one for each of four learning criteria)

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and each subject was assigned the 14 mean climate scores for his class. These climate scores were obtained using the Learning Environment Inventory, which contains 105 items descriptive of typical high school classes (See Anderson, 1968, for a description of the development of the instrument, and Table 1 for the names of the 14 scales). Regression-adjusted gain scores (with the pretest effect partialled out) of individuals were related to individual IQ, class mean climate properties, and their interactions as described below.

STATISTICAL ANALYSIS

Generalized regression analysis with linear, interaction, and curvilinear terms was used in conjunction with a predetermined model to examine the successive contribution of eah effect of interest. The analysis for any one sample and climate scale was done in five steps; first, IQ was correlated with the criterion; second, a two-predictor regression model with IQ and a climate term was tested to determine whether it was significantly better than IQ alone. Third, an IQ-climate interaction term was added to themodel and the three-predictor model was tested to determine its superiority over a two-predictor model; fourth, a curvilinear IQ term was added and similarly tested; and, fifth, a curvilinear climate term was added completing the full five-predictor model. Each new term had to account for additional criterion variance to produce a significant increase in the predictive power of the model. Not only was the contribution of each effect easily determined, but the five-predictor equations were used to sketch some of the regression surfaces, enabling the nature and magnitude of each effect to be examined visually. (See Figs. 1-2)

RESULTS AND DISCUSSION

As it is not possible to discuss the results for all 14 scales in each of the eight samples, three classroom social climate properties - intimacy, friction, and cliqueness - will be considered in their relationships to female gains on one criterion only: the Test of Understanding Science (TOUS). While this will not indicate the full range on results, it will hopefully describe the types of findings that were revealed. Relationships between all climate properties and female TOUS gains are shown in Table 1.

Figure 1 shows the surface generated by the regression equation in the TOUS-female sample, and the "twist" in the surface illustrates clearly that Intimacy is positively related to TOUS gains for females of high ability but bears a negative relationship to learning for females of low ability. This finding is best interpreted by considering the consequences of group norms which are strongest in cohesive groups. Highly intimate groups have powerful norms which

take two forms. For high ability classes, the norm is presumably to study, to achieve, and to go on to college. Hence, the more cohesive such high ability classes are, the more powerful the effect of this norm of learning. On the contrary, students of low ability find school difficult and probably establish a norm of not learning. They find schoolwork uninspiring and, when banded together in a cohesive group, tend to resist learning. Though the relationship occurred only for the TOUS criterion, the intimacy interaction is considered of utmost importance. Indeed, it is surprising that such a relationship holds at all in groups as large as the whole class, and it illustrates the potential, if largely overlooked, influence of this class group property on learning.

As shown in Figure 2, extremes on Friction are positively related to gains in science understanding. This is a totally unanticipated result, but it occurred in two different samples (not shown here) and thus has a small probability of resulting from chance error. For classes containing high friction, one suspects that pupils are forced to withdraw from the peer group influence, escape from the conflict that is associated with their classmates, and perhaps turn their hostilities into their work. The effect might be guised under a different term - competition. If extremely high friction is similar to competition (and this is merely speculation), it could be that extremely low friction is but another term for cooperation. Hence, for this sample at least, it seems that either cooperation or competition is associated with increased learning while mid-levels of friction (perhaps apathy) result in less than optimal gains. The ability interaction is puzzling, but implies that low-ability females learn best when they have the opportunity to challenge one another's ideas. High ability females, on the other hand, profit most from low friction which might be most likely to occur in classes whre pupils are involved in independent rather than group work. The finding, however, needs replication and further in-depth study.

The cliqueness property of school classes acts similarly to friction for females on the TOUS criterion. S-bdivision of the Class friendship groups helps girls of low ability. Few females elect to take a physics course, and those who do, being highly interested in science, form cooperative friendship groups in order to better compete in a "masculine" subject area. For the highly able, however, survival is less a problem, and cliques can be viewed as deterents to learning. The male-female comparison (not shown here) also illustrates this possibility for the lower ability groups. For males, cliqueness is negatively lated to learning, for females, a positive relationship exists. We have here e classic distinction between the clique and the "cabal". In industrial

research (Burns, 1955), cabals were found to consist of individuals who were upward mobile and banded together to facilitate their own careers in the company. Cliques were formed by older employees who could not rise in the beaureaucracy and formed groups to express their mutual criticisms of the company and its leaders. Here, cliques among low ability females could be of the cabal variety and are formed to help girls succeed in physics. However, boys of low ability are less interested in science than are these girls, and possibly form cliques which pit students against teacher and result in poor performance.

These three results give some indication of the types of relationships found in the study. They would seem to be important both to researchers and to teachers. Peer group forces do influence the types of outcomes that result from school experiences. We, as researchers and teachers, must try to understand, control, and harness thier full potential.

Table 1

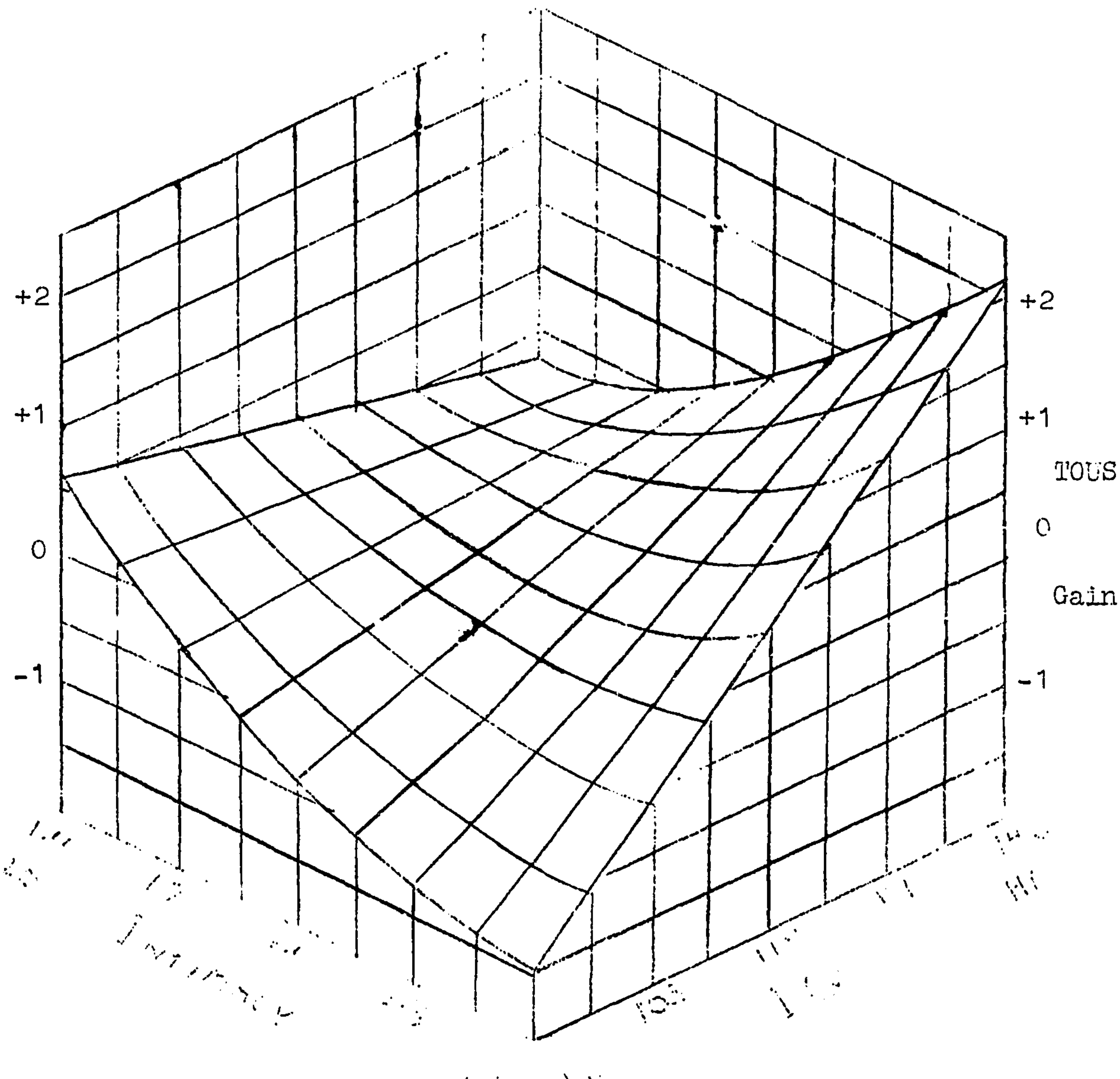
Effects of Classroom Social Climate on Test on Understanding Science Gains for 72 Females

LEI Scale		Multiple Correlations					Overall F Test
		linear		interaction	non-linear		
		IQ	LEI	IQxLEI	IQ	LEI	
Intimacy	R	.30**	.30	.42**	.42	.43	3.1*
	beta	.27	.08	.28	-.01	.10	
Diversity	R	.30**	.30	.32	.32	.33	1.6
	beta	.29	-.02	-.13	.03	-.04	
Formality	R	.30**	.30	.31	.31	.33	1.6
	beta	.37	.11	.00	.01	-.16	
Speed	R	.300**	.31	.31	.31	.31	1.4
	beta	.32	-.03	.08	-.01	.00	
Environment	R	.30**	.30	.30	.31	.31	1.4
	beta	.29	.02	.07	-.02	-.05	
Friction	R	.30**	.44**	.50*	.50	.55*	5.7*
	beta	.26	-.28	-.22	.03	.24	
Goal Direction	R	.30**	.33	.37	.37	.40	2.5*
	beta	.30	.11	.11	-.03	-.17	
Favoritism	R	.30**	.32	.33	.33	.35	1.9
	beta	.20	-.13	-.04	-.05	-.14	
Difficulty	R	.30**	.33	.33	.33	.35	1.8
	beta	.21	.15	-.03	.06	.12	
Apathy	R	.30**	.37	.40*	.41	.41	2.6*
	beta	.29	-.11	-.25	.07	.04	
Democratic	R	.30**	.36	.40	.40	.40	2.6*
	beta	.29	.22	.18	-.02	.00	
Cliqueness	R	.30**	.32	.40*	.41	.41	2.7*
	beta	.28	-.09	-.25	-.08	.08	
Satisfaction	R	.30**	.38*	.39	.39	.39	2.4*
	beta	.31	.22	.10	-.03	.01	
Disorganization	R	.30**	.40*	.41	.41	.43	3.0*
	beta	.38	-.17	-.02	-.01	-.11	

Note: - R is the multiple correlation between all preceding terms and criterion. Beta-weights are shown for the full five-predictor model. Single and double asterisks signify the .05 and .01 levels of significance, respectively.

Figure 1

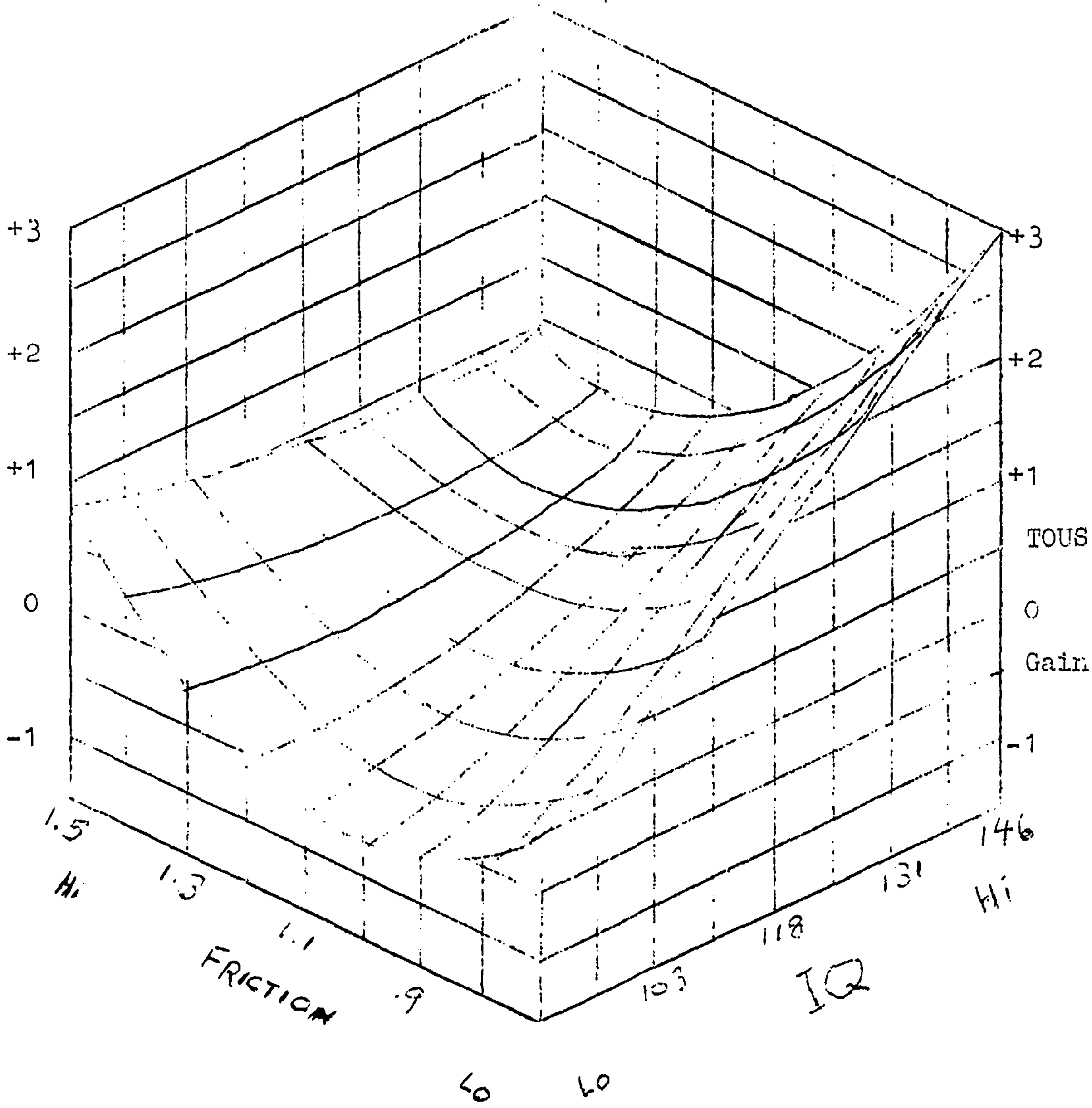
The Relationships Among Class Intimacy, Student Ability, and Test on Understanding Science Gains for 72 Females



Note:--The standardized score form of the equation of the surface is: $z = .27x + .08y + .28xy - .01x^2 + .10y^2$ where x = IQ, y = Intimacy, and z = TOUS gain. The axes are labelled with raw scores for the independent variables. Each scale interval corresponds to 0.5 standard deviations.

Figure 2

The Relationships Among Class Friction, Student Ability, and Test on Understanding Science Gains for 72 Females



Note.--The standardized score form of the equation of the surface is $z = .26x - .28y - .22xy + .03x^2 + .24y^2$; where x = IQ, y = Friction, z = TOUS gain. The axes are labelled with raw scores for the independent variables. Each scale interval corresponds to 0.5 standard deviations.

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